Geometry Standards and Learning Activities

G.G.1. Know correct geometric notation, including the notation for line segment ($\overline{AB}$) and angle (<ABC).

G.G.2. Recognize special types of polygons (e.g., isosceles triangles, parallelograms, and rhombuses).

G.G.3. Apply properties of sides, diagonals, and angles in special polygons; identify their parts and special segments (e.g., altitudes, midsegments); determine interior angles for regular polygons.

Example: Find the interior angles of a regular pentagon.

(See also G.G.2, G.G.4)

Example: How is the measure of the interior angles in a regular polygon related to the number of sides in the polygon?

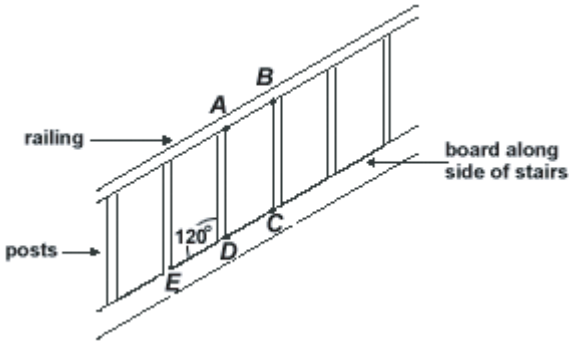
G.G.4. Draw and label sets of points such as line segments, rays, and circles.

G.G.5. Detect symmetries of geometric figures.

G.G.6. Apply the triangle inequality and other inequalities associated with triangles (e.g., the longest side is opposite the greatest angle) to prove theorems and to solve problems.

G.G.7. Use properties and theorems about congruent and similar figures and about perpendicular and parallel lines to solve problems.

Example: Use the diagram below to answer the following question.



Ms. Barnes is building a railing for her stairs. The board along the side of the stairs, the railing, and the posts form parallelograms. If ∠ EDA shown in the figure measures 120°, what is the measure of ∠ ABC?

G.G.8. Write simple proofs of theorems in geometric situations, such as theorems about triangles, congruent and similar figures, and perpendicular and parallel lines (e.g., the longest side is opposite the greatest angle, two lines parallel to a third are parallel to each other; perpendicular bisectors of line segments are the set of all points equidistant from the two end points).

G.G.9. Distinguish between postulates and theorems. Use inductive and deductive reasoning, as well as proof by contradiction. Given a conditional statement, write its inverse, converse, and contrapositive.

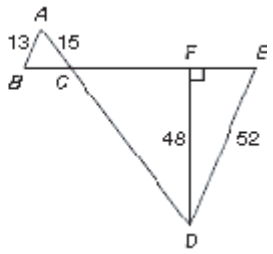
G.G.10. Apply formulas for a rectangular coordinate system to justify theorems.

G.G.11. Draw congruent and similar figures using a compass, straightedge, or protractor. Justify the constructions by logical argument.

G.G.12. Apply congruence and similarity correspondences (e.g., $\Delta ABC \cong \Delta XYZ$) and properties of the figures to find missing parts of geometric figures, and provide logical justification.

Example:

In this figure, $\overline{AB} \parallel \overline{DE}$ and $\overline{DF} \perp \overline{CE}$. Determine the perimeter of ΔABC and the perimeter of ΔCDE. Explain completely how you found your answers and how you know they are correct.



Example: Use the given figure to answer the following question.

Which of the following statements gives enough additional information about the figure above to prove that ΔABC is similar to ΔEDC?

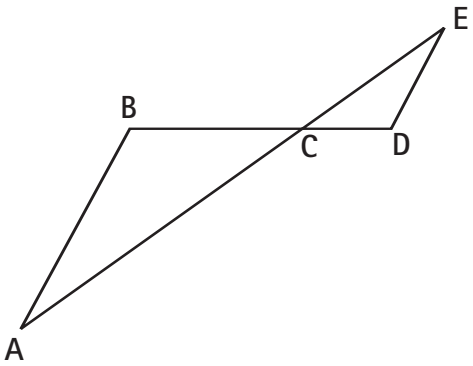
A. $\overline{BC}$ is the same length as $\overline{EC}$.

B. $\overline{BC}$ is twice as long as $\overline{CD}$.

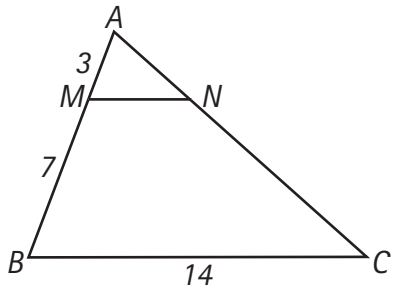
C. $< B$ is congruent to $< D$.

D. $< BCA$ is congruent to $< E$.

(See also G.G.1)



Example: Use the given figure to answer the question below.



In ΔABC above, $\overline{MN}$ is parallel to $\overline{BC}$. What is the length of $\overline{MN}$?

(See also G.G.1)

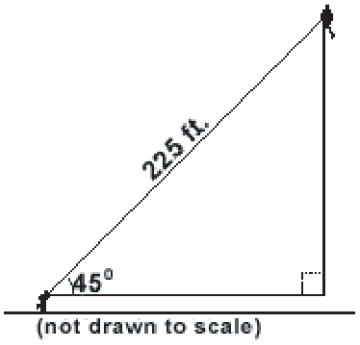
G.G.13. Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.

Example: Your shot put circle was washed out in a storm. There is only a portion left. You can redraw the circle if you know its center. Explain how you could use a geometric construction and the properties of circles to find the center of the original circle.

G.G.14. Solve simple triangle problems using the triangle angle sum property and/or the Pythagorean theorem; study and understand more than one proof of this theorem.

G.G.15. Use the properties of special triangles (e.g., isosceles, equilateral, 30^{o}-60^{o}-90^{o}, 45^{o}-45^{o}-90^{o}) to solve problems.

Example: Use the diagram below to answer the following question.



It is believed that the best angle to fly a kite is 45°. If you fly a kite at this angle and let out 225 feet of string, approximately how high above the ground will the kite be?

(See also G.G.14)

G.G.16. Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.

G.G.17. Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and *x*- and *y*-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line (e.g., by using the point-slope or slope *y*-intercept formulas). Explain the significance of a positive, negative, zero, or undefined slope.

Example: Which of the points below is NOT collinear with the others?

M *(3, –2)* N *(–5, 6)* S *(–9, 10)* T *(10, –21)*

A. N *only*

B. S *only*

C. T *only*

D. They are all collinear.

Example: Which of the following points is at the greatest distance from the origin?

A. *(3, –5)*

B. *(–4, –4)*

C. *(1, –6)*

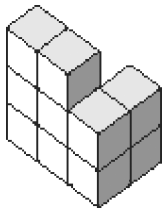
D. *(0, 6)*

G.G.18. Using rectangular coordinates, calculate midpoints of segments, slopes of lines and segments, and distances between two points, and apply the results to the solutions of problems.

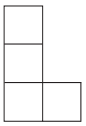
G.G.19. Find linear equations that represent lines either perpendicular or parallel to a given line and through a point (e.g., by using the point-slope form of the equation).

G.G.20. Draw the results and interpret transformations on figures in the coordinate plane such as translations, reflections, rotations, scale factors, and the results of successive transformations. Apply transformations to the solution of problems.

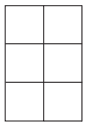
Example: Use the given figure to answer the question below.



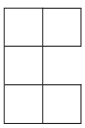
A.



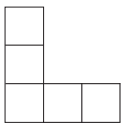
B.



C.



D.



Which diagram could not possibly show how the figure looks when it is viewed directly from above?

Example: You may want to use the following coordinate plane to help answer the question.

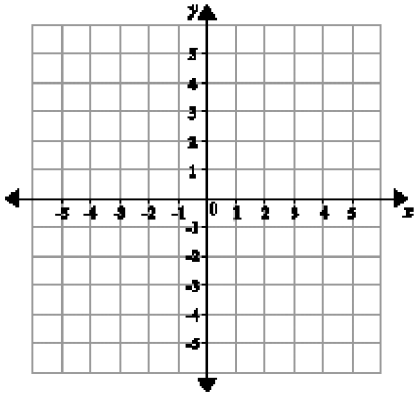
As the result of a transformation, the image of the point (-1,3) is (-3,1). This is an example of a reflection across the

A. line y = x

B. line y = –x

C. x*-axis*

D. y*-axis*



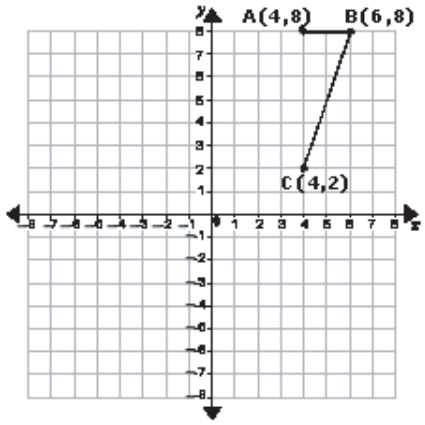
Example: Suppose that the figure ABC is reflected over the y*-axis. What are the coordinates of the image of point A?*

A. (4, –8)

B. (–4, 8)

C. (–8, 4)

D. (8, –4)



G.G.21. Demonstrate the ability to visualize solid objects and recognize their projections, cross sections, and graph points in 3-D.

G.G.22. Find and use measures of perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles.

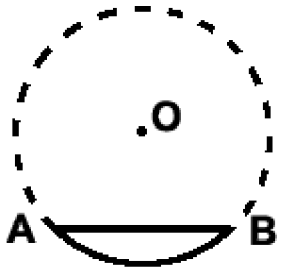
Example: The endpoints of the chord of circle O are A and B, two vertices of a triangle. The third vertex, C, can be located anywhere along the dashed arc. If you locate the vertex so that it forms a triangle that has the largest possible area, which of the following must be true?

A. AB = BC = AC

B. AC < BC

C. AC > BC

D. AC = BC



G.G.23. Find and use measures of lateral areas, surface areas, and volumes of prisms, pyramids, spheres, cylinders, and cones, and relate these measures to each other using formulas.

Example: Find the volume of a sphere with a specified surface area.

G.G.24. Relate changes in the measurement (including units) of one attribute of an object to changes in other attributes.

Example: How does changing the radius or height of a cylinder affect its surface area or volume?

G.G.25. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements.

G.G.26. Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.